product is reconstituted in whole milk or other aqueous liquid. Apparently the emulsifiers previously employed in powdered fat compositions are unable to maintain the fat phase in a dried emulsion in compatible relation with the foam system created in the aqueous phase, the common experience being a product of a low overrun, requiring a prolonged whipping period, and having poor stability, appearance and texture. In toppings and like whipped food emulsions calling for high levels of emulsifiers, the product has a pasty, heavy texture and greasy mouth-feel.

It is, therefore, an object of the present invention to provide a powdered fat composition wherein the fat phase and encapsulating solids perform more effectively upon reconstitution with aqueous liquids in preparing food products generally.

Another specific object of this invention is to provide a powdered fat composition which on incorporation as a shortening in prepared mixes provides baked goods of uniformly high quality and ease of preparation.

Another specific object of this invention is to provide a powdered fat composition which on reconstitution with milk or water and whipping provides an edible emulsion such as a whipped topping which combines the properties of superior mouth-feel, overrun, whipping ease, texture, appearance, and stability.

These and other objects of the present invention will be more fully developed hereinafter.

It has now been found that a dried emulsion containing a fat and one of the aforesaid encapsulating agents provides a powdered fat composition capable of effectively releasing its fat content from a matrix of encapsulating solids upon contact with aqueous liquids when there is included in said composition a partial ester of a glycol and a higher fatty acid. In this manner, a powdered fat composition is provided which is suitable for a wide range of uses including cakes, pastries, breads, toppings, spreads, and the like. On incorporation of these compositions in dry mixes, for preparing baked goods, a mix which may be reconstituted in a very short time and with a minimum of effort is obtained which, at the same time, provides a final food product of exceptionally high quality. When, in addition to reconstitution, the powdered fat composition is to be whipped and accordingly contains a foam-forming protein for the aqueous phase of an emulsion, it appears that the partial ester of a glycol and a higher fatty acid also enhances the compatibility of the aqueous phase and the fat globules such that a higher degree of overrun is obtained. Whether this latter improvement is due to a modification of rehydration or other properties of the protein or is due to a cooperative effect with the fat globules exclusively in an emulsion or stems from a combination of such phenomena is difficult to determine. In any event such a finding is unexpected inasmuch as a paste emulsion containing the present partial ester has generally been found to be quite inferior in overrun compared to pastes containing mono- and di-glycerides for example.

It has further been found that the addition of various lecithins, and modifications and derivatives thereof, to the present above fat composition provides for a further improvement in the condition of the fat phase of the dried emulsion after reconstitution and in improved quality in the final food product. In the case of bakery products generally the presence of lecithin in combination with the above partial esters appears to emulsify the fat phase of the reconstituted dried emulsion in the form of discrete emulsified globules whereby the shortening fat is ideally distributed in the batter during baking. Where the powdered fat is simply reconstituted and whipped to an aerated emulsion, as aforesaid, the texture of the whip is finer and smoother, and the whip is more stable as evidenced by the body and peaking provided when lecithin is employed. In the present dried emulsion it appears that when the protein has foreign materials associated or complexed therewith, as is the case for skim milk or other milk solids, that such protein is unable by itself to disperse and imbibe water in the presence of the fat phase such that lecithin as well as a partial glycol ester of the above type is necessary for short whipping time and high overrun. The term lecithin, as used herein and in the appended claims, is intended to mean phosphatide compositions derived from materials such as soybeans, corn, cottonseed, peanuts, egg yolks, liver, and the like, containing lecithin in varying degrees of purity. Also, phosphatides modified by various processes, such as hydroxylation, phosphorylation, and the like, may be employed.

The most preferred form of lecithin is a vegetable phosphatide which in addition to phosphatidic material has an oleaginous carrier such as soy bean oil or cocoa butter. It is desirable for the purposes of the present invention that the lecithin be highly water dispersible but at the same time have a sufficient emulsification power for the fat phase of the system. By means of hydroxylation, that is the saturation of higher fatty acid groups in the phosphatides such that their degree of unsaturation is reduced, the fat phase is most desirably emulsified into discrete fat globules while being dispersible in the aqueous phase of the system. Hydroxylation is carried out using reagents or combinations thereof described in U.S. 2,445,948 to Wittcoff, July 27, 1948. Actually, it has been found that when employing a hydroxylated lecithin which has an intermediate degree of saturation that there is a more desired balance in the properties of water dispersibility and emulsification so that the phosphatide is most preferably only partially hydroxylated. Thus, in the case of a soy lecithin originally composed of about 65% phosphatide and 35% soy bean oil, the hydroxylated lecithin should have an iodine number in the order of 80. Such a partially saturated lecithin derivative has the additional advantage, of course, of being more stable on storage.

The benefits of this invention are particularly apparent in powdered fat compositions containing, in addition to the aforementioned partial ester and lecithin, a selectively hydrogenated fat, a cow's milk protein or protein derivative such as non-fat milk solids, sodium caseinate or whey solids, and a sugar. In the preparation of these materials, the process which is generally employed requires that an emulsion be made of the fat in an aqueous solution of the milk solids and sugar. This emulsion is then dried by any suitable means such as spray drying, drum drying, and the like; where the material is drum dried, the final flaked product is comminuted to provide a powdered free flowing shortening. In the case of spray drying, however, the final product is in a form which is particulate and free flowing. As viewed under a high power microscope the particles in this latter case are hollow spheres consisting of a matrix of the non-fat milk solids and sugar in which a fine distribution of fat globules is embedded.

The desired partial ester of a glycol and a higher fatty acid may be obtained by reacting any di-hydric alcohol and higher fatty acids, or fats containing fatty acids. The partial esters can be prepared by a number of techniques involving the use of heat and a suitable catalyst. The most common approaches involve either (1) the methylation of fats and the subsequent reaction of the methyl esters with glycol or, (2) the direct esterification of glycol and fatty acids. In the process of esterifying the partial ester the degree of esterification may be complete for some esters formed such that in addition to mono-esters each containing one hydroxyl and one fatty acid there may also be produced di-esters having both hydroxyls substituted for by fatty acids. It has been found that the di-esters by themselves do not provide any improved result in the present dried emulsion. The mono-esters, on the other hand, are essential; but for the more preferred results a mixture of mono and di-esters is required. In the esterification